DPU CITE College of Innovative Technology and Engineering

ระบบฐานข้อมูล

Chapter 01 : Introduction to Database System

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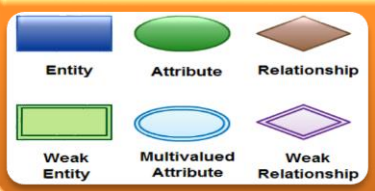
ภาควิชาวิศวกรรมคอมพิวเตอร์ วิทยาลัยนวัตกรรมด้านเทคโนโลยีและวิศวกรรมศาสตร์

Topics

Database and importance

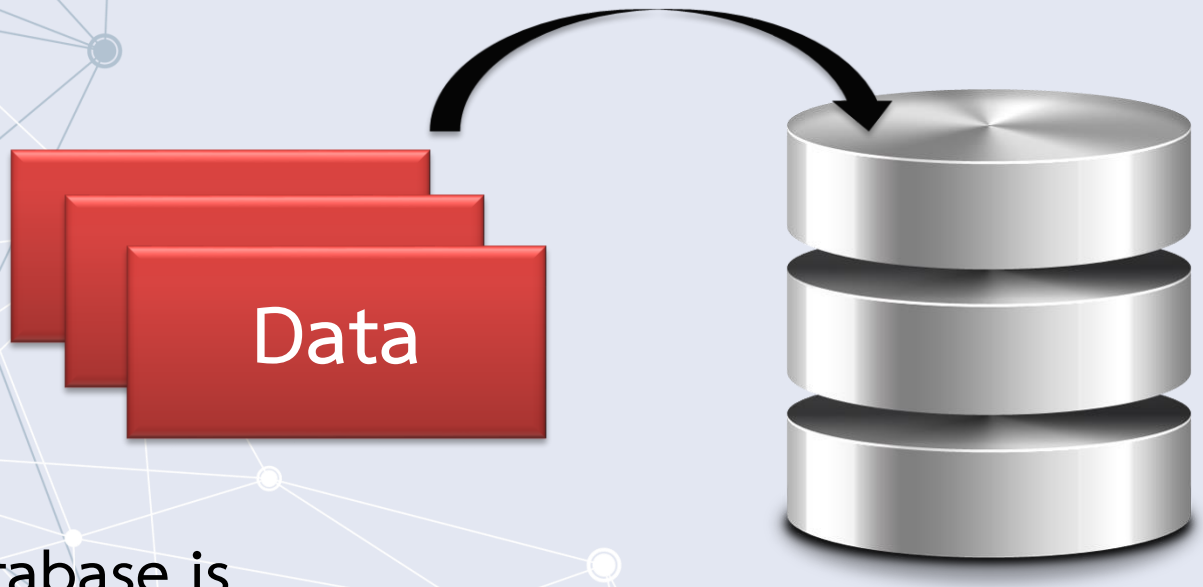
Relational Database

Keys



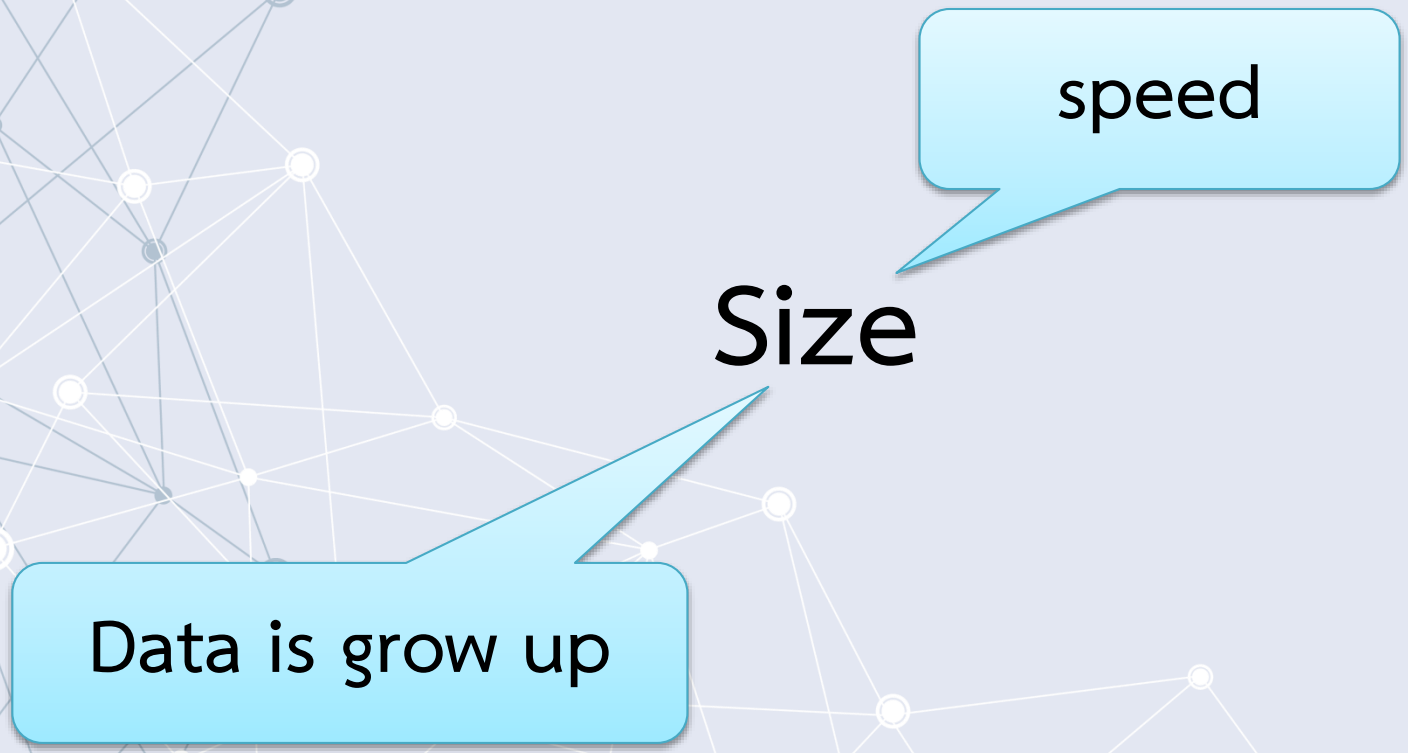
ER Model

What is database?



- Database is
  - a collection of information that is organized
  - easily accessed, managed and updated
  - stores long-term persistent data

The importance of databases



The importance of databases

More than one user at the same time

Ease of updating the data

Updating data

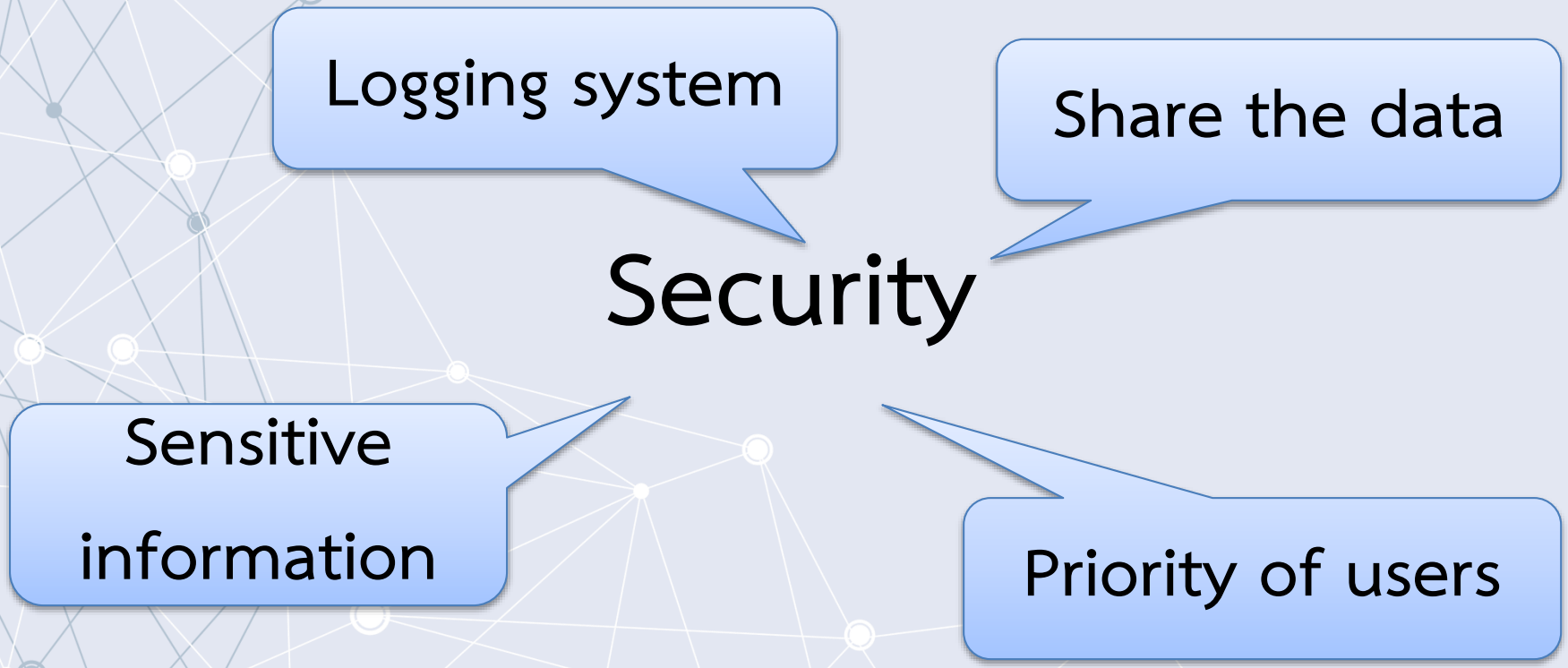
The importance of databases

typing incorrect data

Accuracy

Inconsistency

The importance of databases



The importance of databases

multiple copies

Redundancy

one version of the truth

The importance of databases

spreadsheet crash or disconnect

Importance

Lose data

Types of Database

- Hierarchical databases.
- Network databases.
- Relational databases.
- Object-oriented databases

What is Database Management System ?

A Relational Database Overview

- A database is a means of storing information in such a way that information can be retrieved from it.
- A relational database is one that presents information in tables with rows and columns.
- A table is referred to as a relation in the sense that it is a collection of objects of the same type.
- Data in a table can be related according to common keys or concepts, and the ability to retrieve related data from a table is the basis for the term relational database.
- A Database Management System (DBMS) handles the way data is stored, maintained, and retrieved.

Structure of Relational Database

- A relational database is a collection of tables.
  - Each table has a unique name.
  - Each table consists of multiple rows.
  - Each row is a set of values that by definition are related to each other in someway; these values conform to the attributes or columns of the table.
  - Each attribute of a table defines a set of permitted values for that attribute; this set of permitted set is the domain of that attribute.

Tables

- A table is a collection of related data held in a structured format within a database.
- A table consists of columns and rows.
  - Each row in a table represents a set of related data (tuple)
  - Each row does not allow duplicates
  - Every row in the table has the same structure
  - Order of rows does not matter
  - Order of column (field) does not matter

Example

- Teacher Table

สดมภ์ (a column)

แอตทริบิวต์ (an attribute)

ฟิลด์ (a field)

ID	*NAME*	*STATUS*
430201	รัฐศิลป์	โสด
440607	ณรงค์เดช	สมรส
440701	สุธิดา	สมรส
500621	นุชนาถ	สมรส
600901	บัณฑิต	โสด

แถว (a row)

ทูเพิล (a tuple)

Attributes

- An attribute is a property of a given entity.
- The value of each attribute contains only a single value from that domain.
- Each attribute contains only atomic (indivisible) values.
  - A piece of data in a database table that cannot be broken down any further.

ID	*NAME*	*ADDRESS*

ID	*NAME*	*ADD*	*STREET*	*SUB_DIS*	*DISTRICT*	*PROVINCE*

Relational Schema

- Relational Schemas - describe the structure of data stored in a database.

TEACHER

Relational Schema

ID	*NAME*	*STATUS*
440501	รัฐศิลป์	โสด
500621	นุชนาถ	สมรส
600901	บัณฑิต	โสด

TEACHER(ID, NAME, STATUS)

Keys

- Candidate key - the set of attributes from which primary key can be selected.
  - Uniqueness
  - Minimum
- Primary key - a candidate key that is most appropriate to become main key of the table
  - Uniquely identify each tuple in a table.

Keys

- Super Key - a set of attributes within a table that uniquely identifies each tuple within a table
  - A superset of Candidate key.
- Composite Key - consist of two or more attributes that uniquely identify an entity occurrence
- Alternative key - The candidate key which are not selected for primary key
- Foreign key - an attribute (or collection of attributes) in one table that uniquely identifies a row of another table.

ER Model

- ER Model (Entity-Relationship Model) - A graphical representation of entities and their relationships to each other
- There are 3 basic elements
  - Entity
  - Attribute
  - Relationship

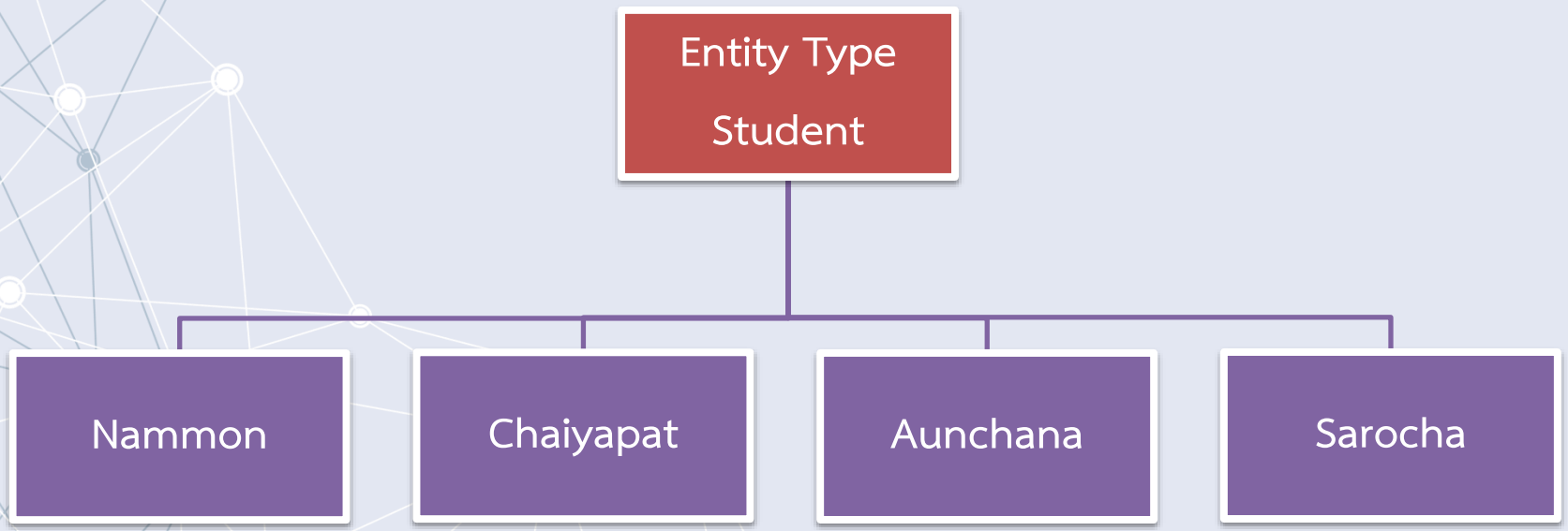
ER Model - Entity

- Entity types - Set of similar objects
- Examples
  - Customer
  - Student
  - Car
  - Product
- Entity - Real-world object or thing with an independent existence and which is distinguishable from other objects.

ER Model - Entity

- Entity types - Set of similar objects
- Entity - Real-world object or thing with an independent existence and which is distinguishable from other objects.
- Examples
  - Customer: Mark, John, Jane, ...
  - Student: Chaiyapat, Nammon, Aunchana, ...
  - Product: Table, Chair, ...

ER Model - Entity



Attribute

- Attribute - A property or characteristic of an entity
- Example
  - Entity Type: Student
  - Attribute: StudentID, StudentName, GPAX, Email, ...

Relationship

- Relationship - How entities act upon each other or are associated with each other.
- Example
  - Entity Type : Student
  - Entity Type : Department
  - Relationship : Student is in Department

Graphical Representation - Entity

- Think of entities as nouns.
  - Regular entities
  - Weak entities - an entity that cannot be uniquely identified by its attributes alone
- Shown as a rectangle

Regular entities

Weak entities

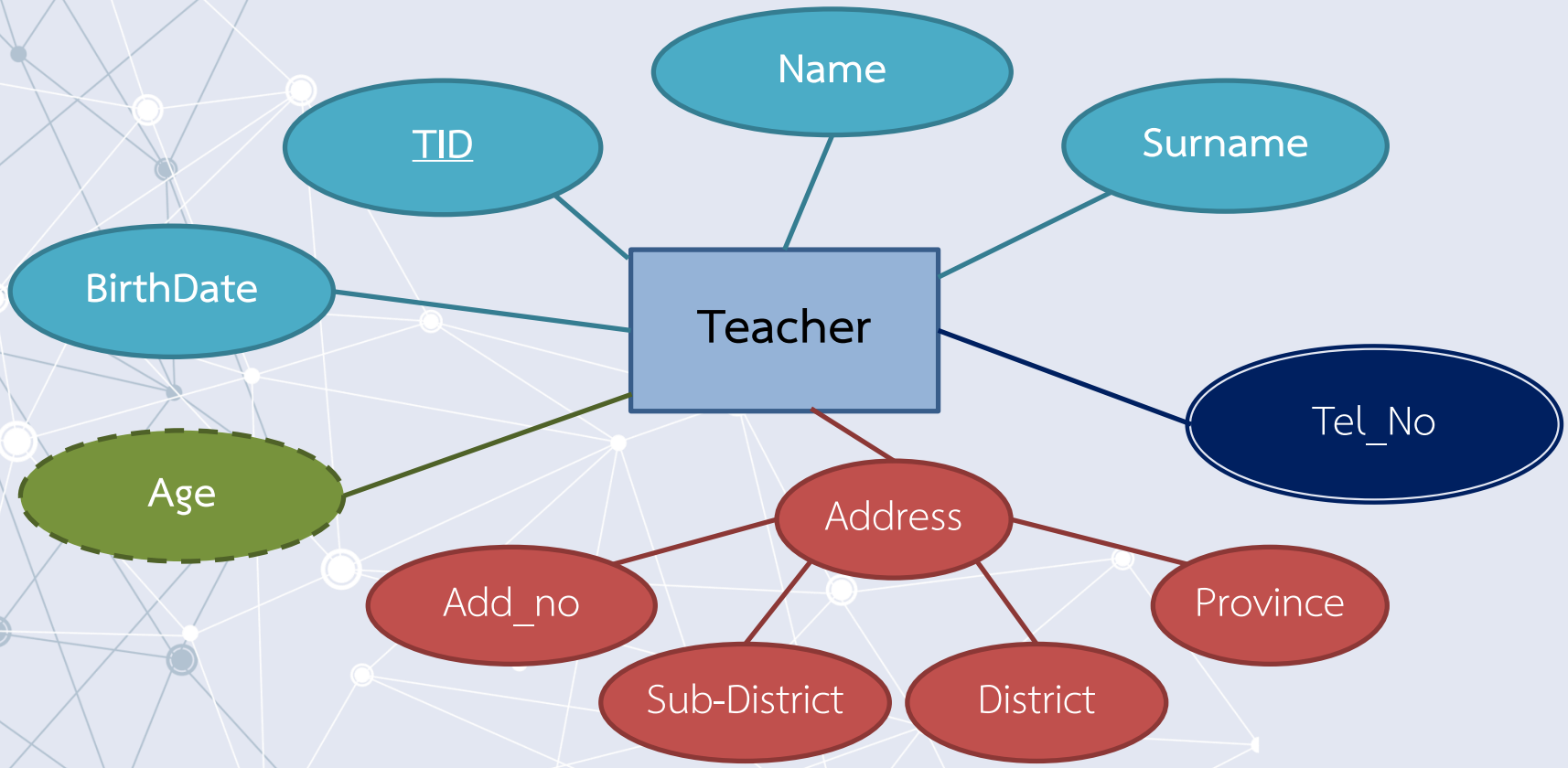
Activity

- Make a group
- Think about Entity (3 Entities) in online book store

Graphical Representation - Attribute

- Shown as an oval or circle
- Simple attributes - the attribute value is atomic and can't be further divided
- Composite attributes - the attribute can be divided into smaller subparts
- Key attributes - the unique characteristic of the entity
- Multi-valued attributes - more than one attribute value
- Derived attribute - attributed is calculated or otherwise derived from another attribute

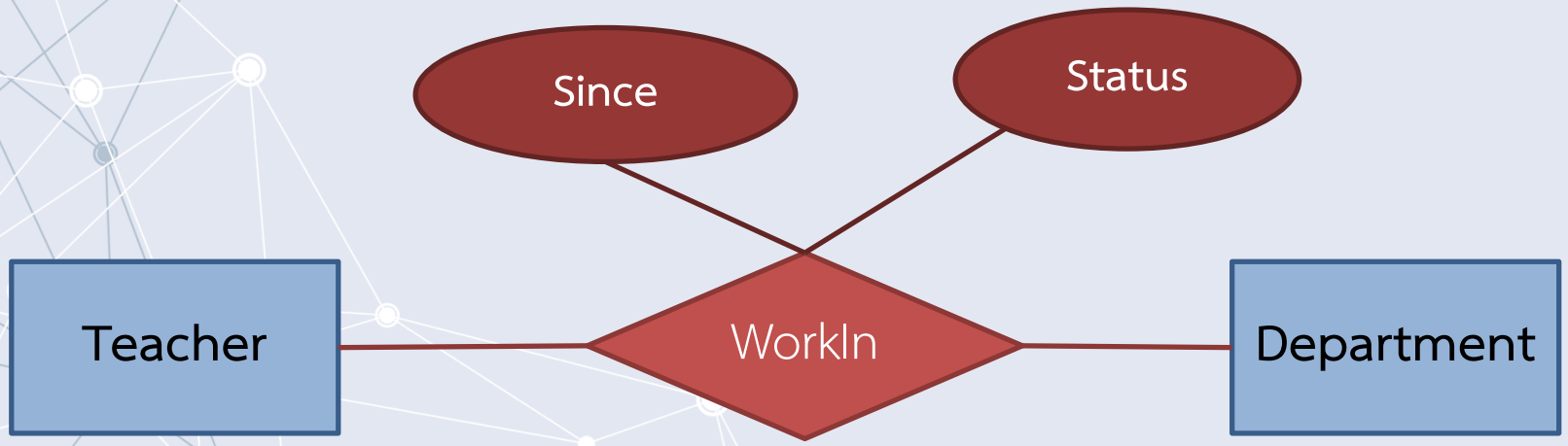
Graphical Representation - Attribute



Activity

- Make a group
- Fill attributes to each entity

Graphical Representation - Relationships



Relationships - Participation

- Participation - participation in relationships when examining how entities relate to one another.
  - Total participation
  - Partial participation

Relationships - Cardinality

- Cardinality - Defines the numerical attributes of the relationship between two entities or entity sets.
  - One-to-One
  - One-to-Many
  - Many-to-Many

Cardinality : One-to-One

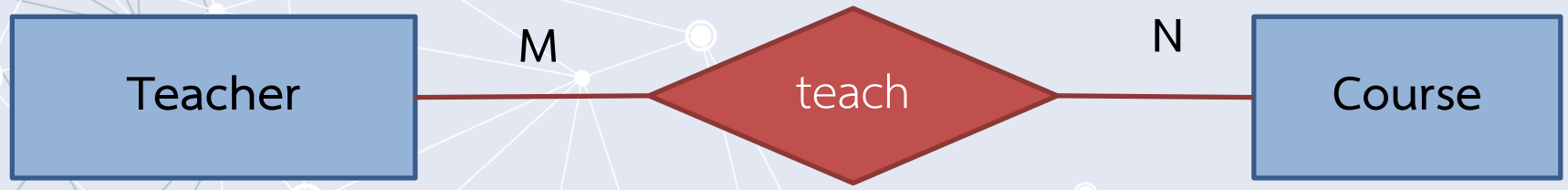
- Each row in one database table is linked to 1 and only 1 other row in another table.
- 1:1

Cardinality : One-to-Many

- Each row in the related to table can be related to many rows in the relating table.
- 1:M / M:1

Cardinality : Many-to-Many

- One or more rows in a table can be related to 0, 1 or many rows in another table.
- M:N / M:M



Activity

- Make a group of three
- Create relationship for entities

Activity 8

- Draw an ER diagram for the following application from the manufacturing industry:
  - Each supplier has a unique name.
  - More than one supplier can be located in the same city.
  - Each part has a unique part number.
  - Each part has a color.
  - A supplier can supply more than one part.
  - A part can be supplied by more than one supplier.
  - A supplier can supply a fixed quantity of each part.

Activity 9

- A university consists of a number of departments. Each department offers several courses. A number of modules make up each course. Students enroll in a particular course and take modules towards the completion of that course. Each module is taught by a lecturer from the appropriate department, and each lecturer tutors a group of students

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Questions & Answers